STABRO LABORATORIES, INC.
TECHNICAL REFERENCE LIBRARY
DOCUMENT CONTROL ADMINISTRATOR

Simpson

INSTRUMENTS THAT STAY ACCURATE

260 Add-A-Tester Adapter

OPERATOR'S MANUAL

BATTERY TESTER MODEL 656

SIMPSON ELECTRIC COMPANY
5200 W. Kinzie St., Chicago 44, Illinois, ES 9-1121
In Canada, Bach-Simpson, Ltd., London, Ontario

New SIMPSON 260 "Add-A-Tester" Line

TRANSISTOR TESTER, Model 650 . . . . . $26.95
Beta Ranges: 0-10, 0-50, 0-250, (F.S.)
Beta Accuracy: ±3%, with 260 ±5% nominal
Ico Range: 0-100 ua
Ico Accuracy: ±1%, with 260 ±3% (F.S.)

DC VTVM, Model 651 . . . . . $32.95
Voltage Ranges: 0-.5/1.0/2.5/5.0/10/25/50/100/250/500
Accuracy: ±1%, with 260 ±3% (F.S.)
Input Impedance: greater than 10 megs all ranges

TEMPERATURE TESTER, Model 652 . . . $38.95
Temperature Ranges: −50°F to +100°F, +100°F to +250°F
Accuracy: with 260 ±2° (nominal)
Three lead positions provided
Sensing Element: thermistor

AC AMMETER, Model 653 . . . . . $18.95
Ranges: 0-0.25/1/2.5/12.5/25 amps
Accuracy: ±1%, with 260 ±3% nominal
Frequency Range: 50 cycles to 3000 cycles

AUDIO WATTMETER, Model 654 . . . . . $18.95
Load Ranges: 4,8,16,600 ohms
Wattage: Continuous 25 watts (8,600 ohms)
50 watts (4,16 ohms)
Intermittent 50 watts (8,600 ohms)
100 watts (4,16 ohms)
Accuracy: ±5%, with 260 ±10% nominal
Direct reading scale from 17 microwatts to 100 watts

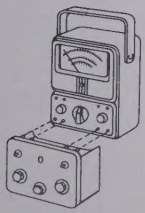
MICROVOLT ATTENUATOR, Model 655 . $18.95
Ranges: 2.5 microvolts to 250,000 microvolts continuously variable in decade steps
Frequency: DC to 20 KC
Accuracy: ±1db

BATTERY TESTER, Model 656 . . . . . $19.95
Checks all radio and hearing aid batteries up to 90 volts at the manufacturer's recommended load, or any external load.

Note: All Simpson 260 Adapters provide for normal 260 usage without disconnecting the adapter.

OPERATOR'S MANUAL

BATTERY TESTER MODEL 656



Just plug it in

SIMPSON ELECTRIC COMPANY

5200 W. Kinzie St., Chicago 44, Illinois, ES 9-1121

In Canada, Bach-Simpson, Ltd., London, Ontario

Copyright 1959, Simpson Electric Co.

Issued June 1959 Printed in U.S.A.

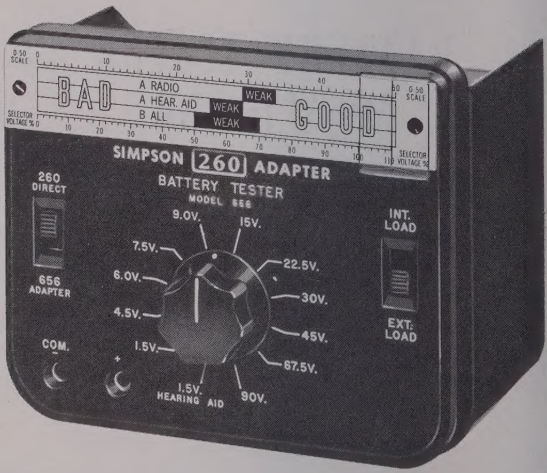


FIGURE 1 – SIMPSON BATTERY TESTER MODEL 656

OPERATOR'S MANUAL

SIMPSON – MODEL 656 ADAPTER

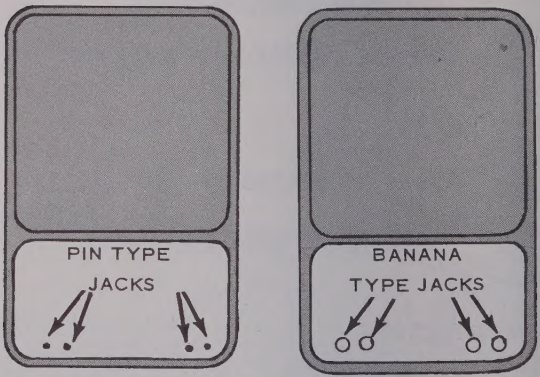
SECTION I

GENERAL DESCRIPTION

INTRODUCTION

The Simpson Battery Tester Model 656 is a compact, self-powered, easy-to-use instrument designed specifically for testing hearing-aid and radio batteries while they are under load. In conjunction with a Simpson Model 260 or Model 270 Volt-Ohm-Milliammeter, the internal condition of a battery can be checked in terms of a GOOD-WEAK-BAD indication or percent of rated output. All tests are in accordance with standard recommendations from leading battery manufacturers.

This Simpson VOM-plus-Adapter concept is completely unique in approach and provides utmost versatility. Each of the Adapter models, of which the Battery Tester is but one example, provides specific measurement and testing capabilities at a fraction of the cost normally required for separate testers.



(a) Model 260, series II (b) Model 260, series III

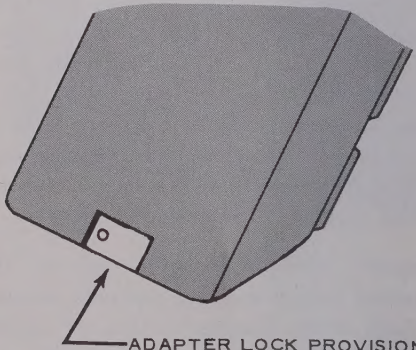


FIGURE 2 – MODEL 260 SERIES IDENTIFICATION

ACCESSORIES FURNISHED

Each instrument is furnished with an Operator's Manual and four extra pin-type plugs. The four pin-type plugs are used only when the Model 656 is to be used with the Model 260 Series II (see figure 2 for Model 260 Series II and Series III identification).

Test leads are not furnished with the Model 656. Any pair of test leads with banana plugs can be used. If desired, they can be obtained under Simpson Part Number 10–837500.

SPECIFICATIONS

Battery Ranges:

Hearing Aid: 1.5 Volts

"A" and "B": 1.5/4.5/6.0/7.5/9.0/15/22.5/30/45/67.5/90 Volts.

Percent of Rated Voltage:

Range: 0 to 110%

Accuracy:

Adapter only: ±2%
Adapter with Model 260: ±4% F.S.
Adapter with Model 270: ±3% F.S.

GENERAL DESCRIPTION

Power Input: None required

Size: 5-5/16 x 4-3/8 x 3-7/16 inches

Weight: 1 lb., 3 oz.

MODIFICATION KITS

Adapter Case Kit 401 for Model 260 Series III and Model 270.

Use of this kit is optional. The kit converts the Model 260 Series III or the Model 270 VOM produced prior to June 1, 1959. It consists of a modified case which permits latching the Model 656 securely to the underside of the multitester.

Adapter Case Kit 402 for Model 260 Series II.

This kit is required for conversion of a Simpson Model 260 Series II to electrically accomodate the Model 656. It includes instructions and parts necessary for the conversion, and provides a 50 microampere D.C. range in the instrument.

FUNCTION OF CONTROLS

BATTERY RANGE SWITCH

The Battery Range switch is located at the center of the front panel. It has twelve positions,

each marked for the battery voltage for which it is to be used. There are two positions marked for 1.5 volt batteries; one is for small hearing aid type batteries, and is marked HEARING AID; the other is for general type 1.5 volt batteries.

INT. LOAD – EXT. LOAD

This is a slide switch located at the right center of the front panel. In the INT. LOAD position, the manufacturers' recommended load is placed across the battery under test. In the EXT. LOAD position, the 656 supplies no load except for the metering circuit (1 milliampere maximum). This allows the battery to be checked in its actual operating circuit.

260 DIRECT – 656 ADAPTER SWITCH

The slide switch at the left center of the front panel is a convenience switch. It permits use of the Multimeter alone without detaching the Model 656.

SLIDE RULE

The slide rule at the top of the panel is used to convert the readings of the Model 260/270 to relative battery conditions. When the hairline is placed over the reading shown on the Model 260/270, the condition of the battery under test (i.e., GOOD, WEAK, BAD) and its percent of rated voltage can be read from the slide rule.

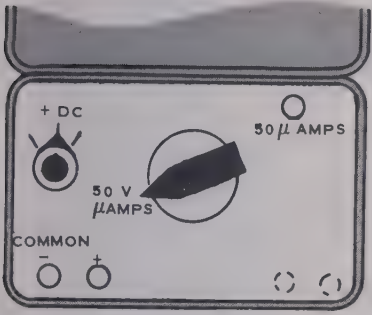
SECTION II

OPERATING INSTRUCTIONS

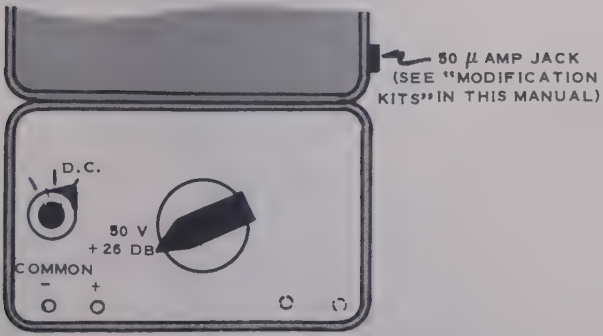
1. Initial Adjustments

a. Model 260/270 Control Settings (see figure 3)

1. With the Model 656 disconnected, check the meter pointer position for zero indication in its operating position. If the pointer is off zero, adjust the bakelite screw under the meter. Refer to the VOM Operator's Manual for further information on this adjustment.



(a) Model 260 Series III, Control Positions and Jack used with Model 656.



(b) Modified Model 260 Series II, Control Positions and Jack used with Model 656.

FIGURE 3 – MODEL 260 CONTROL POSITIONS FOR USE WITH MODEL 656

2. Set the Model 260/270 for +DC operation.

3. Set the Model 260/270 range switch to the 50V position.

b. Model 656 Control Settings

1. Set the 260 DIRECT – 656 ADAPTER switch in the 656 ADAPTER position.

c. Connecting the Model 656 to the VOM

1. Insert the top four plugs of the Model 656 into the lower four jacks of the Model 260/270.

2. Insert the short lead from the Model 656 into the 50 μAMP jack.

3. Position the adapter locking latch underneath the instrument to secure the two units.

CAUTION

If your Model 260/270 case does not have the locking provision, avoid applying excessive pressure to the top of the Adapter when it is used in the Adjust-A-Vue position. A modification kit, which includes a new case with an adapter locking provision is recommended for optimum rigidity (see page 4).

2. Battery Tests – Common Types

a. Set the Battery Range switch of the Model 656 at the position corresponding to the voltage of the battery to be tested.

NOTE

If battery voltage is different from the ranges which have been established, see page 12 for the correct switch position and procedure.

b. Set the INT. LOAD – EXT. LOAD switch at the position desired. To check a battery which is not connected in a circuit, set the switch at INT. LOAD. To check a battery in its normal operating circuit, set the switch at EXT. LOAD.

c. Connect a test lead from the COM – jack on the Model 656 to the – battery terminal. Connect a test lead from the + jack to the + battery terminal.

d. Read the 0-50 scale on the Model 260/270.

e. Set the hairline of the slide rule at the reading obtained on the VOM. Use the top scale of the slide rule, marked 0-50.

f. Read the relative battery condition on the slide rule.

1. For hearing aid batteries, use the scale marked HEARING AID, and read the battery condition on the GOOD-WEAK-BAD markings.

2. For "A" batteries, use the scale marked "A", and read the battery condition on the GOOD-WEAK-BAD markings.

3. For "B" batteries, use the scale marked "B", and read the battery condition on the GOOD-WEAK-BAD markings.

4. For all battery types, read the percent of rated voltage output on the percent scale at the bottom of the slide rule. The actual battery voltage can be determined by multiplying the Battery Range switch setting by the indicated percentage.

3. Battery Tests – Special Types

The battery ranges of the Model 656 were selected to accomodate the voltages most commonly used in radio, hearing aid, and industrial service. Occasionally it may be necessary to test a battery whose rated voltage is not marked on the Battery Range switch. To check such a battery, a special battery chart was developed.

This chart includes the 1.34 volt mercury cell, and "B" batteries and flashlight cells from 1.5 volts through 99 volts in steps of 1.5 volts. The "Selector Voltage %" scale of the 656 slide rule is used as the reference in determining battery condition.

Using this chart as a guide, follow the procedure outlined for testing common type batteries. The chart is used to determine the Battery Range switch position and to interpret the "Selector Voltage %" slide rule reading.

For example, to test a 75 volt battery, use the following procedure:

1. Set the 656 range switch at 90.
2. Repeat steps b, c, d, e, under "Battery Tests – Common Types".
3. Record the "Selector Voltage %" reading on the slide rule.
4. Compare this reading with the chart values shown in columns 3 and 4.
5. If the scale reading is above 58, the battery can be considered good.
6. The actual battery voltage will be the scale reading divided by 83 and multiplied by the rated voltage; i.e., if the Selector Voltage % scale reads 70, the actual battery voltage is $70 \div 83 \times 75$ volts which equals 63.3 volts.

BATTERY REFERENCE CHART

BATTERY UNDER TEST (VOLTS)	656 RANGE SETTING	SLIDE RULE READING (SELECTOR VOLTAGE % SCALE) BATTERY GOOD ABOVE	100% RATED VOLTAGE INDICATION
1.34 (mercury)	1.5 H.A.	72	89
1.5	1.5	70	100
3.	4.5	47	67
4.5	4.5	70	100
6.	6.	70	100
7.5	7.5	70	100
9.	9.	70	100
10.5	15.	49	70
12.	15.	56	80
13.5	15.	63	90
15.	15.	70	100
16.5	15.	77	110
18.	22.5	56	80
19.5	22.5	61	87
21.	22.5	65	93
22.5	22.5	70	100
24.	22.5	75	107
25.5	30.	60	85
27.	30.	63	90
28.5	30.	67	95
30.	30.	70	100
31.5	30.	73	105
33.	30.	77	110

BATTERY UNDER TEST (VOLTS)	656 RANGE SETTING	SLIDE RULE READING (SELECTOR VOLTAGE % SCALE) BATTERY GOOD ABOVE	100% RATED VOLTAGE INDICATION
34.5	45.	54	77
36.	45.	56	80
37.5	45.	58	83
39.	45.	61	87
40.5	45.	63	90
42.	45.	65	93
43.5	45.	68	97
45.	45.	70	100
46.5	45.	72	103
48.	45.	75	107
49.5	45.	77	110
51.	67.5	53	76
52.5	67.5	54	78
54.	67.5	56	80
55.5	67.5	58	82
57.	67.5	59	84
58.5	67.5	61	87
60.	67.5	62	89
61.5	67.5	64	91
63.	67.5	65	93
64.5	67.5	67	96
66.	67.5	68	98
67.5	67.5	70	100
69.	67.5	72	102
70.5	67.5	73	104
72	67.5	75	107

BATTERY UNDER TEST (VOLTS)	656 RANGE SETTING	SLIDE RULE READING (SELECTOR VOLTAGE % SCALE) BATTERY GOOD ABOVE	100% RATED VOLTAGE INDICATION
73.5	67.5	76	109
75.	90.	58	83
76.5	90.	59	85
78.	90.	61	87
79.5	90.	62	88
81.	90.	63	90
82.5	90.	64	92
84.	90.	65	93
85.5	90.	67	95
87.	90.	68	97
88.5	90.	69	98
90.	90.	70	100
91.5	90.	71	102
93.	90.	72	103
94.5	90.	73	105
96.	90.	75	107
97.5	90.	76	108
99.	90.	77	110

The values shown in the BATTERY GOOD ABOVE column in this chart are calculated for "B" batteries and flashlight cells, where a battery under recommended load is considered good if its measured voltage is above 70% of rated voltage.

For other types of batteries, the "Good Above" percentage is:

Hearing Aid batteries	65%
Radio "A" batteries	75%
Ignition cells	75%
Mercury cells	80%

To determine the number which indicates "Good Above" for these batteries, multiply the number under 100% RATED VOLTAGE INDICATION by the percentage shown above. For example, to determine the "Good Above" reading for a 75 volt "A" battery, multiply 83 (reading in last column) by 75% (for radio "A" batteries).

$$83 \times 75\% = 62$$

So, 62 is the "Good Above" value for this type of 75 volt battery.

SECTION III

THEORY OF OPERATION

GENERAL

The terminal voltage of a battery is determined by two factors. The chemical composition of the battery is the first factor, and it determines the voltage difference between the two terminals. Internal resistance is the other factor, and this determines how much voltage the battery will deliver to the load. Internal resistance increases as the battery is used; a GOOD battery has very little internal resistance, while a BAD battery has more internal resistance.

The Model 656 Battery Tester provides a load circuit for the battery under test which determines the amount of current through it. The voltage across the load is then measured. This load voltage is, in effect, the battery no-load-voltage minus the voltage drop across the internal resistance.

The amount of load resistance for each range of the Model 656 is determined by leading battery manufacturers, and is related to the normal circuit load for which its capacity is intended. For each

type of battery, the "end-of-life" point is established as the condition which causes load voltage to be below a given percent. This percent, for each cell type, is as follows:

Hearing Aid "A" Batteries	65%
All "B" Batteries, Flashlight cells	70%
Radio "A" Batteries, Ignition cells	75%
Mercury cells	80%

The Model 656 includes a multiplier resistor for each range, in order to convert the 50 microampere D.C. range of the Model 260/270 into a voltmeter circuit. For each range, resistance is such that with nominal (100% rated) voltage applied through the meter circuit, the meter indicates 45 on its 0-50 scale.

SECTION IV

MAINTENANCE

CASE REMOVAL

To remove the instrument from the case, first be sure it is detached from the VOM and that test leads are removed. Then remove the four screws located in the four corners on the back of the instrument case. All components are attached to the front panel.

PARTS REPLACEMENT

All of the components in the Model 656 have been engineered for many years of useful life. However, there are conditions under which parts may become damaged or faulty and require replacement. Refer to the circuit diagram in figure 4 to help identify and locate any suspected part.

In the event of any component failure, order replacement parts from Simpson Electric Company or from any of its Authorized Warranty Repair Stations. A list of the repair stations is included, beginning on page 22.

PARTS LIST

Reference Symbol	Description	Simpson Part No.
R1	Resistor, 5.1 ohms ±5%, ½ w	1–118193
R2	Resistor, 15 ohms ±5%, ½ w	1–118194
R3	Resistor, 56 ohms ±5%, ½ w	1–118195
R4	Resistor, 27 ohms ±5%, ½ w	1–118196
R5	Resistor, 27 ohms ±5%, ½ w	1–118196
R6	Resistor, 27 ohms ±5%, ½ w	1–118196
R7	Resistor, 5.1K ±5%, 1 w	1–118197
R8	Resistor, 2.4K ±5%, ½ w	1–118198
R9	Resistor, 2.4K ±5%, ½ w	1–118198
R10	Resistor, 3K ±1%, ½ w	1–113287
R11	Resistor, 1.5K ±1%, ½ w	1–113648
R12	Resistor, 1.5K ±1%, ½ w	1–113648
R13	Resistor, 1.5K ±1%, ½ w	1–113648
R14	Resistor, 6K ±1%, ½ w	1–113650
R15	Resistor, 7.5K ±1%, ½ w	1–113370
R16	Resistor, 7.5K ±1%, ½ w	1–113370
R17	Resistor, 15K ±1%, ½ w	1–113347
R18	Resistor, 22.5K ±1%, ½ w	1–113651
R19	Resistor, 22.5K ±1%, ½ w	1–113651
R20	Resistor, 234 ohms ±1%, ½ w	1–118200
R21	Resistor, 1276 ohms ±1%, ½ w	1–118199

Reference Symbol	Description	Simpson Part No.
SW1	Switch, rotary, for ranges	1–118191
SW2	Switch, slide, DPDT, 260 - 656	1–118192
SW3	Switch, slide, DPDT, INT. LOAD - EXT. LOAD	1–118192
	Slide rule Scale	1–118270A
	Slide rule Screw	1–118142
	Slide rule Hairline Indicator	1–118139
	Slide rule Spring	1–118140
	Lead, 50 μAMP connection	3–810802
	Case, Adapter	10–860379

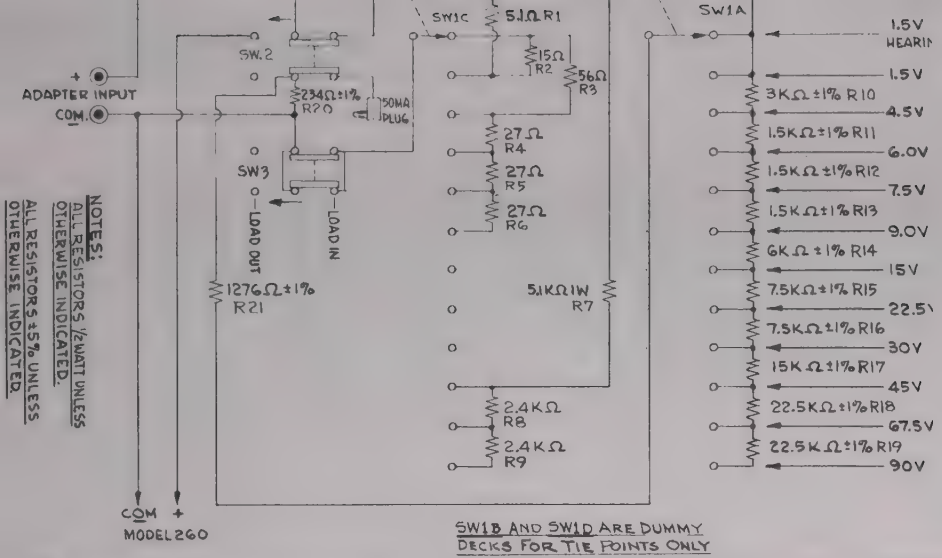


FIGURE 4 – SIMPSON BATTERY TESTER MODEL 656, SCHEMATIC DIAGRAM

SIMPSON WARRANTY REPAIR STATIONS AND PARTS DEPOTS

*California, Los Angeles
Quality Electric Company
3700 South Broadway
States: So. California below Fresno and Arizona

*California, San Francisco
Pacific Electrical Instrument Lab.
111 Main Street
States: No. California above Fresno and Nevada

Canada
Bach-Simpson Ltd.
1255 Brydges Street
P.O. Box 484
London, Ontario, Canada

*Colorado, Denver
Meter-Master Instrument Service
2379 S. Downing Street
States: Wyoming, Utah, Colo. and New Mexico

Florida, Miami
Barfield Instrument Corp.
4101 N.W. 29th Street

*Parts Depots

*Georgia, Atlanta
Electro-Tech Equipment
690 Murphy Avenue S.W.
States: Alabama, Georgia, Florida,
No. & So. Carolina, and Tenn.

*Illinois, Chicago
Pacific Indicator Company
5217 W. Madison Street
States: Chicago, Wisconsin and Indiana

*Louisiana, New Orleans
Industrial Instrument Works
3328 Magazine Street
States: Arkansas, Mississippi and Louisiana

*Massachusetts, Cambridge
Alvin C. Mancib Company
363 Walden Street
States: Vermont, New Hampshire, Massachusetts,
Connecticut, Rhode Island, and Maine

*Michigan, Detroit
Ram Meter, Inc.
1100 Hilton Road, Ferndale
States: Michigan

*Minnesota, Minneapolis
Instrumentation Services
4807 Idaho Avenue North
States: Minnesota, North and South Dakota

*Parts Depots

*Missouri, St. Louis
Scherrer Instruments
5449 Delmar Blvd.
States: Illinois below Peoria, Iowa, Missouri, and Kansas

*New York, Buffalo
Electrical Instrument Labs.
1487 Hertel Avenue
States: New York State Except Met. N.Y.

*New York 7, New York
Simpson Instrument Service Corp.
27 Park Place
States: Metropolitan New York and New Jersey, above Trenton

New York 13, New York
Electro-Tech Equipment Co.
308 Canal Street

New York, Syracuse
Syracuse Instrument Lab.
2904 South Avenue

*Ohio, Cleveland
Weschler Electric Company
4250 W. 130th Street
States: Ohio and Kentucky

*Parts Depots

Oregon, Portland
The Instrument Laboratory
1316 S.E. 7th Avenue

*Pennsylvania, Philadelphia
Sunshine Scientific Instrument
1810 Grant Avenue
States: Penn. Md. New Jersey below Trenton, Virginia, W. Virginia, Washington, D.C., Delaware

*Texas, Dallas
Nelson Electronic Eng. Co., Inc.
6333 Prospect Avenue
States: Oklahoma and Texas

Utah, Salt Lake City
Salt Lake Instrument Service
2247 Wilson Avenue

*Washington, Seattle
The Instrument Laboratory, Inc.
934 Elliott Avenue West
States: Oregon, Washington, Idaho, and Montana

*Parts Depots

Add-A-Tester Adapter

Model 651
DC VTVM

Designed for

TRANSISTOR CIRCUITRY
and GENERAL (AGC, Power
Supplies, etc.) SERVICING.

Laboratory Type DC
Coverage (10 ranges)

★

NET PRICE

$32.95

★

SIMPSON ELECTRIC COMPANY

5200 West Kinzie Street • Chicago 44, Illinois

WARRANTY

SIMPSON ELECTRIC COMPANY warrants each instrument and other articles of equipment manufactured by it to be free from defects in material and workmanship under normal use and service, its obligation under this warranty being limited to making good at its factory any instrument or other article of equipment which shall within 90 days after delivery of such instrument or other article of equipment to the original purchaser be returned intact to it, or to one of its authorized service stations, with transportation charges prepaid, and which its examination shall disclose to its satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties expressed or implied and of all other obligations or liabilities on its part, and SIMPSON ELECTRIC COMPANY neither assumes nor authorizes any other persons to assume for it any other liability in connection with the sale of its products.

This warranty shall not apply to any instrument or other article of equipment which shall have been repaired or altered outside the SIMPSON ELECTRIC COMPANY factory or authorized service stations, nor which has been subject to misuse, negligence or accident, incorrect wiring by others, or installation or use not in accord with instructions furnished by the manufacturer.

Quality is the indispensable component of every Simpson instrument . . . . . .